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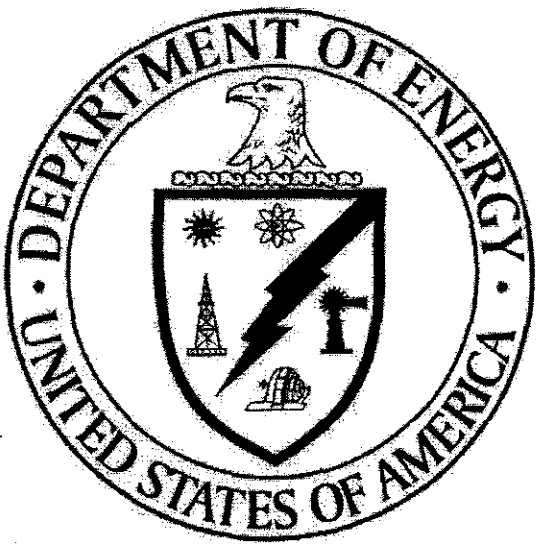

Final Report

Surveillance of the Thomas Jefferson National Accelerator Facility Rigging and Material Handling Activities August 2005

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1.0 INTRODUCTION

A surveillance of the Thomas Jefferson National Accelerator Facility (TJNAF or Jefferson Lab) Rigging and Material Handling (R&MH) activities was conducted on August 23-26, 2005, by David Worrall, U.S. Department of Energy (DOE), Oak Ridge Office (ORO), and Sheila Thornton, Parallax, Inc., as requested by the DOE Thomas Jefferson Site Office (TJSO). The surveillance was conducted to evaluate R&MH activities at TJNAF in accordance with the Review Plan for Rigging and Material Handling Surveillance, August 23-26, 2005 (TJSO-2005-002). TJSO provided the specific areas requiring assessment, and Steve Neilson, TJSO, facilitated the surveillance. Jefferson Lab is managed and operated by Southeastern Universities Research Association (SURA) for DOE.

2.0 LIST OF ACRONYMS

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
CY	Calendar Year
DOE	Department of Energy
EEL	Experimental Equipment Laboratory
EH&S	Environment, Health, and Safety
FIND	Finding
MHER	Material Handling Equipment Representative
MHSR	Material Handling Safety Representative
NFPA	National Fire Protection Association
NP	Noteworthy Practice
OBS	Observation
ORO	Oak Ridge Office
OSHA	Occupational, Safety, and Health Administration
PIV	Powered Industrial Vehicle
R&MH	Rigging and Material Handling
SURA	Southeastern Universities Research Association
TJNAF	Thomas Jefferson National Accelerator Facility
TJSO	Thomas Jefferson Site Office

3.0 DISCUSSION OF RESULTS

3.1 Criteria Evaluated

The team addressed each of the elements provided by the TJSO during the surveillance, and the results are discussed below. A list of personnel interviewed is provided in Appendix A, and a list of the various documents reviewed is provided in Appendix B.

Training and Qualifications

Training records were reviewed for six TJNAF personnel. For the personnel training records reviewed, all personnel were current in their material handling equipment training. The lesson plan and training module for aerial platform training administered by the Material Handling Safety Representative (MHSR) were reviewed, and a portion of the test given to the employees upon completion of the training module was also reviewed. The material handling

training provided to the employees has clearly defined roles and responsibilities for the participants involved in material handling activities. In general personnel interviewed were knowledgeable of the material handling equipment for which they were qualified; however, one individual was not aware of capacity limitation when extending the tines on a stand-up forklift.

Specific on-the-job training material handling job instructions are provided to the material handling employees by the supervisors. Personnel are required to demonstrate proficiency in operating the specific material handling equipment as part of the initial and refresher training.

Six material handling employees' medical records were reviewed to determine whether the employees were identified as a material handler and whether the individuals had been given the required medical examination as part of their baseline physical (e.g., audio, visual, dexterity). All six individuals were identified within the medical records as being a powered industrial vehicle (PIV) operator, and the appropriate medical tests had been administered and evaluated.

Overall the content of the TJNAF training program provides adequate information to ensure safe operations of material handling equipment. There were no training and qualification findings (FIND), three observations (OBS), and one noteworthy practice (NP) identified in the area of training and qualifications (**OBS-2, OBS-11, OBS-17, and NP-1**). The details of the findings, observations, and noteworthy practices are provided in Section 4.0.

Equipment Inspections and Maintenance

TJNAF has implemented an equipment inspection program; however, deficiencies with the program implementation resulted in two monorail hoists being brought on site without being incorporated in the inspection program. Overall, in most instances, material handling equipment inspections are being conducted on an annual basis. While the inspection program is established and some lubrication of equipment is accomplished during periodic inspections, a preventative maintenance program as required by Work Smart Set Item 87 (29 CFR 1910.179) was not developed.

There were four equipment inspection and maintenance findings (**FIND-1, -2, -3 and -4**), eight observations (**OBS-1, -3, -5, -7, -9, -10, -13, and -18**), and one noteworthy practice (**NP-6**) pertaining to equipment inspections and maintenance activities at TJNAF. The details of the findings, observations, and noteworthy practices are provided in Section 4.0.

Lifting Activities and Material Handling Site Conditions

The team observed material handling operations in several locations throughout the complex, and all operations observed were performed in a safe manner. One lift utilizing a crane was observed, and the personnel were knowledgeable of how to safely perform lifting operations. TJNAF utilizes a graded approach to the planning, approval, and execution of crane lifts based on the hazards and complexity. Safe lifting and material handling practices are being carried out at TJNAF; however, opportunities for improvement were identified in the areas of custom fabricated equipment and legacy equipment upgrades.

There were no lifting activity and material handling site condition findings, five observations (**OBS-12, -14, -15, -16, and -19**), and three noteworthy practices (**NP-2, -3, and -4**) pertaining

to lifting and material handling activities at TJNAF. The details of the findings, observations, and noteworthy practices are provided in Section 4.0.

Program Management

The team reviewed the SURA contract with DOE and determined the OSHA construction standard, 29 CFR 1926, is not included as a regulatory requirement. While appropriate External Sufficient Standards are incorporated to assure R&MH requirements were flowed down into the contract, the American National Standards Institute (ANSI) standards were dated (old) and should be revisited to incorporate the most current revision to the standards. The crane inspector subcontract with SURA was also reviewed. While the crane inspector's subcontract contained appropriate references to ensure the subcontractor performing the inspections conducted the inspections in a safe manner, the documentation provided to SURA by the inspector does not indicate that all requirements of 29 Code of Federal Regulations (CFR) 1910.179 or ANSI B30.2 (Work Smart Standards Set Item 87) for periodic inspections are being met. The R&MH equipment should be inspected to ensure compliance with the requirements. A review of the contract may be warranted to include additional language to ensure the equipment inspected is in accordance with sufficient standards.

The Integrated Safety Management principle of self improvement and feedback is another area that may warrant further consideration. Other than the Improvement Team Report conducted in 2004 that was issued, SURA documentation of a self assessment program to assess R&MH activities was not evident.

There were no program management findings, three observations (**OBS -4, -6 and -8**), and one noteworthy practice (**NP-5**) pertaining to program management at TJNAF. The details of the findings, observations, and noteworthy practices are provided in Section 4.0.

3.2 Regulatory Requirements, EH&S Manual References, External Sufficient Standards, and Best Management Practices

Following are the regulatory requirements in the SURA contract; TJNAF Environment, Health, and Safety (EH&S) Manual references; External Sufficient Standards; and additional national consensus standards pertaining to the R&MH operations assessed during the surveillance:

Regulatory Requirements

- 29 CFR 1910.176 - Material Handling
- 29 CFR 1910.179 - Overhead and Gantry Cranes
- 29 CFR 1910.178 - Powered Industrial Trucks
- 29 CFR 1910.180 – Crawler Locomotive and Truck Cranes
- 29 CFR 1910.184 – Slings

EH&S Manual Requirements

- 6140 - Cranes and Hoists
- 6145 – Forklifts
- 6147 - Aerial Work Platforms

External Sufficient Standards

- ASME B30.20 (1993) - Below the Hook Lifting Device
- ASME/ANSI B30.5 (1989) - Mobile and Locomotive Cranes
- ASME/ANSI B30.9 (1990) - Slings and Rigging
- ANSI B.30.2.0 (1990) – Overhead and Gantry Cranes
- ANSI B 30.10 (1993)– Hooks
- NFPA 505 - Powered Industrial Trucks
- ANSI B56.1 - Standard for Powered Industrial Trucks

Other Regulatory and National Consensus Standards

- 29 CFR 1926, Health and Safety Regulations for Construction
- DOE-STD-1090 – Hoisting and Rigging
- ANSI B 30.7 – Base-Mounted Drum Hoist
- ANSI B 30.11 – Monorail Systems and Underhung Cranes
- ANSI B 30.16 – Overhead Hoist

3.3 Conclusion

As evidenced by the six noteworthy practices identified, the TJNAF personnel are very knowledgeable of R&MH safe practices, and the overall R&MH program is being conducted in a safe manner that would protect TJNAF personnel. The four findings are regulatory requirements, and the appropriate citations are shown following each finding. The nineteen observations noted are provided to assist the TJNAF R&MH staff in improving the overall R&MH program through compliance with recommended practices in national consensus standards or best management practices to improve the safety of material handling activities at the lab.

4.0 FINDINGS, OBSERVATIONS, AND NOTEWORTHY PRACTICES

4.1 Findings

FIND-1 A crane was located in the Experimental Equipment Laboratory (EEL) that had been retrofitted from a pendant to a radio-controlled crane, and the crane was not equipped with an audible alarm [29 Code of Federal Register (CFR) 1910.179(i)]. A second crane was identified in the Test Lab with a control pendant in use that showed indication of ineffective strain relief in that the cord was pulling away from its connection point to the hoist [29 CFR 1910.179(g)(1)(iv)].

FIND-2 Monthly wire rope and hoist chain inspections with documentation for overhead cranes are not being conducted on a monthly basis. Work Smart Standards Item 87 (29 Code of Federal Regulations 1910.179 and 1910.180) requires such inspection be documented and signed by the inspectors. [29 CFR 1910.179(m)(1) and 29 CFR 1910.179(j)(2)(iv)]

FIND-3 Monthly running wire rope inspection and documentation is not being performed as required for mobile cranes by Work Smart Standards Item 87. [29 CFR 1910.180(g)(1)]

FIND-4 A preventative maintenance program is not in place for cranes as required by Work Smart Standards Set Item 87 (29 CFR 1910.179). While some crane lubrication is performed during inspection, it does not constitute a preventative maintenance program

4.2 Observations

OBS-1 Users of material handling equipment have no visual method of determining whether equipment has been properly inspected. Annual inspection due dates are not present with equipment and the current checklists do not afford a means to verify daily inspections have been conducted.

OBS-2 An individual identified as a "crane-owner" (building manager) was unaware of responsibilities as identified in EH&S Manual 6140.

OBS-3 While some mechanisms are in place, a receipt inspection of mobile cranes is not conducted in all instances to ensure suitability of equipment received and safe operational conditions.

OBS-4 The current DOE contract with SURA does not include OSHA construction standard, 29 CFR 1926. While applicable ANSI standards are incorporated in the contract, the ANSI standards are dated and have been revised several times since the date of the standards incorporation.

OBS-5 Two A-frame monorail hoists on rollers were noted without required inspection credentials.

OBS-6 As defined in the EH&S Manual 6140, critical lifts include, among other things, lift activities with close tolerance installations and high susceptibility of damage. Discussions with operations personnel have indicated no critical lifts have been conducted in several years even though lifts that are frequently necessitated in the Halls meet the criteria of a critical lift.

OBS-7 The crane inspector does not utilize a checklist when conducting inspections on overhead cranes, nor does the documentation provided to the Lab indicate that all requirements of 29 CFR 1910.179 or ANSI B30.2 for periodic inspections are being met. In addition, the Lab has not verified the qualifications of the crane inspector.

OBS-8 The Lab's contract with the crane inspection subcontractor does not specify that inspections must be conducted in accordance with applicable national consensus standards.

OBS-9 The current procedure requires forklifts be inspected every six months; however, some forklifts are only scheduled for an annual inspection based on the documentation provided.

OBS-10 Based upon discussions with a rigger and crane inspector, torque wrenches are not being used when installing swivel hoist rings and in conducting inspection of cranes, respectively.

OBS-11 Based upon a discussion with a forklift operator, the operator did not have full understanding of the effects of load position on the capacity of the forklift.

OBS-12 A battery charging station located in the Test Lab's Vacuum Tech Shop was inadequately protected against damage by trucks. [NFPA 505.8.3.2.1(3)]

OBS-13 Several shackles (eight) were observed in which the pin did not match the width of the shackle, making the shackles unsatisfactory. With the current controls in place in the procurement process, the question remains as to how these shackles were made available for use.

OBS-14 In the Test Lab, custom-fabricated, stainless steel, wire-rope slings do not have markings to identify their rated capacity or other unique identifiers. Load test certificates stipulated in the EH&S Manual 6240-T3 without unique identifiers are meaningless.

OBS-15 Legacy equipment does not have contemporary safety devices as exemplified by the absence of anti-2 block device on the mobile crane and absence of a seat belt on the Allis Chalmers Forklift 17202607.

OBS-16 An overhead crane radio controller used in the EEL's Machine Shop and the Gantry hoist pendant located outdoors outside of the Machine Shop did not have directional controls labeled consistent with the bridge and trolley compass directions.

OBS-17 Multiple types of forklifts, manlifts, and cranes are present in a given work area, and practical proficiency must be demonstrated for the different types of equipment operated to be deemed qualified to operate any one of them. Since the Lab discontinued the use of issuing material handling license as required in E&HS Manual 6140, there is no systematic, unified approach to identify user qualifications on specific material handling equipment. While this issue was identified by the lab during a previous assessment, areas without adequate control of material handling equipment use was observed.

OBS-18 Upon review of the Dresser mobile crane, the annual inspection date was eight days beyond its one-year anniversary, and while not having been used for the past two months, additional conditions were observed that should be corrected prior to use which included: fire extinguisher needing recharging and hand-signal posting replaced.

OBS-19 The storage rack located outside the Machine Shop contained inadequately restrained metal piping. (Corrected on the spot)

4.3 Noteworthy Practices

NP-1 The Material Handling Safety Representative (MHSR)/Service Coordinator is very knowledgeable of the equipment and regulations relating to the material handling equipment located on site. The workforce recognizes and utilizes the MHSR as the point of contact for all Lab material handling activities.

NP-2 The Procurement Organization has a process in place that requires review of material handling acquisitions by the MHSR, reducing the likelihood of acquiring nonconforming or unsafe material handling equipment.

NP-3 The Lab should be commended for excessing old material handling equipment thereby enhancing the reliability of the fleet and ensuring vehicles are equipped with more contemporary safety devices.

NP-4 In some locations, forklifts and cranes are controlled through the use of a key access code system required to check out the equipment.

NP-5 Environment, Health, and Safety (EH&S) personnel recognized the need and are in the process of modifying the EH&S material handling related procedures.

NP-6 To address prior recommendations, the Lab is in the process of building a facility to store forklift equipment alleviating the congested equipment and keeping the equipment out of the elements.

Appendix A – Personnel Interviewed

- Environment, Health, and Safety (EH&S) Manager
- Material Handling Safety Representative (MHSR) and Material Handling Service Coordinator
- Material Handling Equipment Representative (MHER) and Fire Protection Engineer
- Crane Inspector Subcontractor (Foley Material Handling Company, Inc.)
- Material Handling Operator
- Vacuum Technician
- Systems Operations and Maintenance Manager
- Physics Division Safety Representative
- Hall A Detector Systems Coordinator
- Hall C Work Coordinator
- Capital Project Manager
- SURA Procurement Representatives
- Building Manager
- Operations Personnel
- Rigger
- Forklift Operator

Appendix B – Documents Reviewed

- Manlift Inventory, Photographs, and Inspection Reports
- Forklift/Tractors/Tow Vehicle Inventories, Photographs, and Inspection Reports
- Jefferson Lab Material Handling Training Program General Information
- Listing of Individuals Completing Training Courses: SAF 302 (Aerial Platforms), SAF 402 (Cranes), and SAF 502 (Forklifts)
- Jefferson Lab Crane and Hoist Data Summary Sheet and Crane Inspection Reports
- EH&S Manual 3320, Temporary Operational Safety Procedure Moving Cold Cryomodule 2LXX to Slot 1L03
- Standard Operating Procedure A-01-008-SOP, Crane and Overhead Gantry Wire Rope Inspections
- Southeastern Universities Research Association (SURA), Thomas Jefferson National Accelerator Facility (Jefferson Lab), Blanket Ordering Agreement Contract
- Lockwood Brothers Inc., New Employee Health and Safety Orientation Program
- EH&S Manual Appendix 2410-T2, TJNAF Work Smart Standards Set
- Performance Work Statement, Crane and Hoist Inspection Service (SURA Contract with Foley Material Handling Company, Inc.)
- SURA Purchase Requisition 235882, Example of Material Handling Equipment Purchase
- Example of Test Question for Credit Card Holders on Hoisting and Rigging Equipment Restriction
- Thomas Jefferson National Accelerator Facility Procedures for Use of the SURA/Jefferson Lab Purchase Card
- Jefferson Lab Listing of Procurement Codes
- Corrective Actions from Material Handling Improvement Team Report
- Jefferson Lab EH&S Division Organization Chart
- Examples of Director's Safety Council Meeting Minutes Dated December 6 and 13, 2004; January 24, 2005; and February 14, 2005
- Excerpts from U.S. Department of Energy and SURA Contract
- Revised Draft of EH&S Manual 6140
- Six Training Records
- Six Material Handling Employees medical records